



An Economic Analysis the Cost and Return per Hectare and Output Input Ratio of Different Size Farm of Group of Aloe Vera Cultivators in Jhunjhunu District of Rajasthan, India

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

This study presents a comprehensive cost and returns analysis of Aloe Vera cultivation, aiming to provide farmers and potential investors with valuable insights into the financial aspects of cultivating Aloe Vera. The study was conducted in Chirawa block of Jhunjhunu during the year 2022 as based on the fact that a large area is covered under the cultivation of Aloe Vera in Rajasthan. The present

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study was done by taking 80 farmers from 12 villages. The findings of this research provide an in-depth understanding of the financial viability of Aloe Vera cultivation. The total cultivation cost per hectare of marginal was rupee 97975, small (rupee 95596), semi medium (rupee 93147) and medium (rupee 90596). The analysis of the cost and return per hectare and farm profitability among different sizes of farms in a group of Aloe Vera cultivators indicated that medium farms generally exhibit higher profitability and efficiency. Input output ratio was 2.39, 2.50, 2.61 and 2.75 for marginal, small, semi medium and medium farmers. The cost and return analysis, along with the assessment of farm profitability, are essential tools for farmers, investors, and policymakers involved in Aloe Vera cultivation.

Keywords: Cost and returns; farm profitability; gross returns; net income; output input ratio.

1. INTRODUCTION

Agriculture indeed is the lifeline of Indian economy since it provides food, surplus labour, raw materials, capital, etc. to the industrial urban sector. Aloe Vera holds significant agricultural value as a versatile crop. Its ability to thrive in arid conditions and withstand drought makes it an ideal choice for cultivation in tropical and subtropical regions. With its low maintenance requirements, Aloe Vera provides farmers with a relatively hassle-free crop that can be harvested multiple times a year. Its market demand in industries like cosmetics, pharmaceuticals, and food and beverages adds to its economic potential. Aloe Vera cultivation also contributes to soil improvement through its root system and organic matter production. Furthermore, its medicinal properties make it a valuable crop with various value-added opportunities [1]. Overall, Aloe Vera offers a sustainable and profitable agricultural option that diversifies crop portfolios and supports economic growth in farming communities. Aloe Vera is one of the most demanding medicinal herbs in today's era. Aloe Vera (*Aloe barbadensis miller*) is known by several names like GhrithKumari, Guwarpatha and Indian Aloe Vera and is widely cultivated because of its wide adaptability and use as a medicinal plant especially in dry areas [2]. Internationally, Aloe Vera is grown largely in South Texas of USA, Mexico, India, Central America, Australia and Africa. Region-wise, Thailand is the biggest producer of Aloe Vera gel accounting for around a third of the total global production. Other leading producers in the North and South American region include Mexico, Dominican Republic, United States and Costa Rica. The global Aloe Vera market reached the value of 5881.640 crores in 2021. The global Aloe Vera market is expected to grow at a CAGR of 7.8% from 2021 to 2028, driven by increasing demand for natural and organic products and the growing awareness of the health benefits of Aloe

Vera. Cosmetics, the largest end-use sector for Aloe Vera extracts, accounts for over 45 per cent of global demand in 2021. The total area under Aloe Vera cultivation in Rajasthan is 1446 hectares with production of 4081 MT and yield 2706 kg per hectare [3]. Indian Aloe Vera market stood at 1965.48 crores in 2017 and is projected to grow at a CAGR of over 10.02% in value terms during 2019-2024, to reach 3209 crores 2024 [4].

2. METHODOLOGY

Selection of District - The study was conducted in Jhunjhunu District of the Rajasthan State. Jhunjhunu District is one of the district of shekhawati region in the cultivation of Aloe Vera on commercial scale and it is a major Aloe Vera growing district. Thus Jhunjhunu district was selected purposively for the study.

Selection of blocks- Jhunjhunu district comprises of 11 blocks, viz. Jhunjhunu, Alsisar, Buhana, Chirawa, Khetri, Mandawa, Nawalgarh, Pilani, Singhana, Surajgarh, Udaipurwati Among these blocks Chirawa was selected purposely for the thesis on area under Aloe Vera cultivation.

Selection of Village- A complete list of all villages was obtained from related Gram Panchayat office therefore, villages were arranged in ascending order on the basis of area under Aloe Vera cultivation, and then 5% villages were selected randomly.

Selection of respondents/farmers- A complete list of all Aloe Vera farmers was obtained from the gram pradhan/head. These farmers were arranged in ascending order on the basis of their land holding, there after these farmers were categorized in four size farm group. Out of that 10% respondents were selected randomly on the basis of Aloe Vera cultivation for the study.

Table 1. Selection of respondents

S. No.	Villages	Total no. of Aloe Vera cultivators					Selected Aloe Vera cultivators				
		Marginal	Small	Semi medium	Medium	Total	Marginal	Small	Semi medium	Medium	Total
1	Adooka	20	10	10	10	50	2	1	1	1	5
2	Ardawata	30	20	10	10	70	3	2	1	1	7
3	Sultana	60	50	40	20	170	6	5	4	2	17
4	Ojtu	20	10	10	10	50	2	1	1	1	5
5	Narhar	10	10	10	10	40	1	1	1	1	4
6	Mandrela	20	50	20	20	110	2	5	2	2	11
7	Lekhwa	10	10	10	10	40	1	1	1	1	4
8	Chanana	10	10	20	10	50	1	1	2	1	5
9	Kithana	20	10	10	10	50	2	1	1	1	5
10	Dalmiyon ki dhani	10	10	20	10	50	1	1	2	1	5
11	Lamba	30	10	10	10	60	3	1	1	1	6
12	Gadaniya	10	30	10	10	60	1	3	1	1	6
	Total	250	230	180	140	800	25	23	18	14	80

3. ANALYTICAL TOOLS

Arithmetic mean:

The arithmetic mean for variable 'X' is calculated by the formula.

$$A.M.=\frac{\sum Xi}{N}$$

Where, AM = Arithmetic Mean

$\sum Xi$ = Sum of Variables

N = Total Number of Variable

Measures of Cost Concepts:

The different costs items are that are included under each cost concept are detailed below with their procedures.

Cost A1 = i. value of hired human labor

ii. Value of hired bullock labor

iii. Value of owned bullock labor

iv. Value of owned machinery labor

v. Hired machinery charges

vi. Value of seed (both farm produced and Purchased)

vii. Value of insecticide and pesticide

viii. Value of manured (owned and purchased)

ix. Value of fertilizer

x. Depreciation on implements and farm buildings

xi. Irrigation charges

xii. Land revenue, cesses and other taxes

xiii. Interest on working capital

xiv. Miscellaneous expenses (artisans etc.)

Cost A2 = Rent paid for leased in land, if any

Cost B = Cost A2 + Imputed rental value of owned land + interest of fixed capital

Cost C = Cost B + Imputed value of family labour + Managerial cost. Cost C is the total cost of cultivation

Output Input ratio:

Output Input ratio will be worked out by using following

Formula :

Output Input ratio = Gross Returns/ Total cost of cultivation

Measures of Farm Profitability:

1. Gross income = per quintal price x yield per hectare in quintal

2. Farm business income = Gross income – Cost A2

3. Net income = Gross income – Cost C

4. Family labor income = Gross income – Cost B

5. Input output ratio (cost benefit ratio) = Cost C - Gross income

4. RESULTS AND DISCUSSION

4.1 Cost analysis of Aloe Vera Cultivation

The cost and return analysis of Aloe Vera cultivation plays a crucial role in understanding the financial viability and profitability of cultivating this versatile plant. It provides valuable insights into the expenses involved at each stage of Aloe Vera cultivation, as well as the potential returns that can be expected the cost and return analysis helps identify potential constraints and challenges that may impact the profitability of Aloe Vera cultivation.

The costs incurred on Aloe Vera cultivation have been classified into following three categories:

1. Establishment cost
2. Maintenance cost
3. Total cost of cultivation

4.2 Establishment Cost

Aloe Vera growers had to invest considerable amount on the establishment of Aloe Vera in the initial years till they reached the first cutting. During this period, usually two years are commonly required. This period is known as gestation period. The investment made by the farmers in establishing the crop right from the pre-planting stage to the first cutting is termed as establishment cost. The cost of establishment of Aloe Vera crop on different groups of farms was estimated by aggregating the cost of various items like land preparation, cost of suckers, plantation cost, farm yard manures, irrigation charges, weeding and hoeing etc. [4]. Since investment for establishing the Aloe Vera crop continues for two consecutive years. The total cost per hectare for establishing Aloe Vera crop was rupee 79497 for marginal, rupee 75901, rupee 72399 and rupee 69677 for small, semi medium and medium farmers respectively. Under establishment cost, total operational and fixed costs were worked out to be 70.73 and 29.25 per cent of total establishment cost.

4.3 Maintenance Cost (2nd year)

Aloe Vera cultivators have to incur expenditure on maintenance of the crop on the second year. The cost incurred by Aloe Vera growers on cultural practices and fixed costs after first year of establishment of the crop is categorized as maintenance cost. The maintenance cost

Table 2. Establishment cost of aloe vera (1st year)

						Rs/ha
Sl. No.	Particulars	Marginal	Small	Semi medium	Medium	Average
A	Operational cost					
1	Land preparation	3100 (3.89)	3000 (3.95)	2800 (3.86)	2700 (3.87)	2900 (3.89)
1a	Harrowing	1860	1800	1680	1620	1740
1b	Rotavator (Clot Breaking)	620	600	560	520	575
1c	Levelling	620	600	560	520	575
2	Baby plant cost	30000 (37.73)	28000 (36.89)	25500 (35.22)	24000 (34.44)	26875 (36.07)
3	Planting cost	12000 (15.09)	11200 (14.75)	11000 (15.19)	10400 (14.92)	11150 (14.98)
4	Irrigation charges	2500 (3.14)	2360 (3.10)	2300 (3.17)	2240 (3.21)	2350 (3.15)
5	FYM	1500 (1.88)	1411 (1.85)	1359 (1.87)	1313 (1.88)	1396 (1.87)
6	Weeding and hoeing	4700 (5.91)	4320 (5.69)	3880 (5.35)	3500 (5.02)	4100 (5.49)
7	Interest on working capital @8%	4304 (5.41)	4023 (5.30)	3748 (5.17)	3532 (5.06)	3901 (5.23)
	Total operational cost	58104 (73.08)	54314 (71.55)	50587 (69.87)	47685 (68.43)	52672 (70.73)
B	Fixed cost					
8	Rental value of owned land	15000 (18.86)	15000 (19.76)	15000 (20.71)	15000 (21.52)	15000 (20.21)
9	Land revenue	60 (0.07)	75 (0.09)	80 (0.11)	85 (0.12)	75 (0.09)
10	Depreciation on fixed capital	3333 (4.19)	3221 (4.24)	3121 (4.31)	3007 (4.31)	3170 (4.26)
11	Interest on fixed capital @10%	3000 (3.77)	3291 (4.33)	3611 (4.98)	3900 (5.59)	3450 (4.66)
	Total Fixed Cost	21393 (26.91)	21587 (28.44)	21812 (30.12)	21992 (31.56)	21696 (29.25)
	Total establishment cost of first year (A+B)	79497 (100)	75901 (100)	72399 (100)	69677 (100)	74368 (100)

(Figures in the parentheses indicate percentage to total)

Table 3. Maintenance cost of aloe vera

						Rs/ha
Sl. No.	Particulars	Marginal	Small	Semi medium	Medium	Average
A						
Operational cost						
1	Weeding and hoeing	4700 (15.26)	4320 (14.24)	3880 (12.95)	3500 (11.82)	4100 (13.56)
2	Irrigation charges	2500 (8.11)	2360 (7.78)	2300 (7.67)	2240 (7.56)	2350 (7.78)
3	FYM	1500 (4.87)	1411 (4.65)	1359 (4.53)	1313 (4.43)	1396 (4.62)
3	Interest on working capital @8%	696 (2.26)	647 (2.13)	603 (2.01)	564 (1.90)	627 (2.07)
Total operational cost		9396 (30.51)	8738 (28.81)	8142 (27.18)	7617 (25.72)	8473 (28.05)
B						
Fixed Cost						
4	Rental value of owned land	15000 (48.71)	15000 (49.46)	15000 (50.07)	15000 (50.66)	15000 (49.72)
5	Interest on fixed capital @10%	3000 (9.74)	3291 (10.85)	3611 (12.05)	3900 (13.17)	3450 (11.45)
6	Depreciation on fixed capital	3333 (10.82)	3421 (11.28)	3645 (12.16)	3711 (12.53)	3527 (11.69)
7	Land revenue	60 (0.19)	75 (0.24)	80 (0.26)	85 (0.28)	75 (0.24)
Total Fixed Cost		21393 (69.48)	21587 (71.18)	21812 (72.81)	21992 (74.27)	21696 (71.93)
Total maintenance cost 2nd year (A+B)		30789 (100)	30325 (100)	29954 (100)	29609 (100)	30169 (100)

(Figures in the parentheses indicate percentage to total.

Table 4. Cost of cultivation of aloe vera

						Rs/ha
Sl. No.	Particulars	Marginal	Small	Semi medium	Medium	Average
1	Hired human labour(male/female)	37600 (41.83)	36960 (38.66)	35890 (38.53)	35000 (38.63)	36362 (39.41)
2	FYM	1500 (1.53)	1411 (1.47)	1359 (1.45)	1313 (1.44)	1396 (1.47)
3	Weeding	4700 (4.79)	4320 (4.51)	3880 (4.16)	3500 (3.86)	4100 (4.33)
4	Miscellaneous	12010 (12.25)	11422 (11.94)	10735 (11.52)	10428 (11.58)	11149 (11.82)
4a	8% of Establishment cost	8823	8498	8188	7943	8363
4b	Refreshment for labours	1401	1223	1100	1197	1230
4c	Medical emergency and cleaning	1786	1701	1447	1108	1510
5	Irrigation charges	2500 (2.55)	2360 (2.46)	2300 (2.46)	2240 (2.47)	2350 (2.48)
7	Interest on working capital @8%	4665 (4.76)	4517 (4.72)	4333 (4.65)	4199 (4.63)	4428 (4.69)
8	Cost A (1-7)	62975 (64.27)	60990 (63.79)	58497 (62.80)	56680 (62.56)	59785 (63.35)
9	Rental value of owned land	15000 (15.31)	15000 (15.69)	15000 (16.10)	15000 (16.55)	15000 (15.91)
10	Land revenue	60 (0.06)	75 (0.07)	80 (0.08)	85 (0.09)	75 (0.07)
11	Depreciation on fixed capital	3333 (3.40)	3421 (3.57)	3645 (3.91)	3711 (4.09)	3527 (3.74)
12	Interest on fixed capital @10%	3000 (3.06)	3291 (3.44)	3611 (3.87)	3900 (4.30)	3450 (3.66)
13	Cost B (8-12)	84368 (86.11)	82577 (86.38)	80833 (86.78)	78859 (87.04)	81659 (86.57)
14	Family human labour (male/female)	4700 (4.79)	4320 (4.51)	3880 (4.16)	3500 (3.86)	4100 (4.33)
15	Cost C (13-14)	89068 (90.91)	86897 (90.90)	84713 (90.94)	82359 (90.90)	85759 (90.91)
16	Managerial Cost(10 per cent of cost c)	8907 (9.09)	8699 (9.09)	8434 (9.06)	8237 (9.09)	8569 (9.09)
17	Total cost(15-16)	97975 (100)	95596 (100)	93147 (100)	90596 (100)	94328 (100)

(Figures in the parentheses indicate percentage to total)

included the expenses on various items viz., weeding and hoeing, irrigation charges, FYM and fixed costs. Total cost for maintenance of Aloe Vera crop was estimated to be rupee 30789 for marginal, rupee 30325, rupee 29954 and rupee 29609 for small, semi medium and medium farmers respectively. Under maintenance cost, total operational and fixed costs were worked out to be 28.05 and 71.93 per cent of total maintenance cost.

4.4 Total Cost of Cultivation

After the planting Aloe Vera takes 18-24 months to get mature and in a year it can be cultivated 4 times. Cost of hired human labour was calculated at the rate of rupee 0.70-0.80 per kg and the weeding rate was rupee 0.06-0.10 per kg and the family human labour was rupee 0.06-0.10 per kg. The number of days and number of labours working per day was increased with the increase in the size of the farm. Cost of cultivation per hectare decreased with the increase in the farm size medium farmers had the lowest cost of cultivation per hectare (rupee 90596) whereas marginal farmers had the highest cost of cultivation (rupee 97975). Component wise hired human labour cost was highest (39.41%) followed by rented value of owned land (15.91%). Cost A accounted for 63.35 per cent of total cost, cost B accounted for 86.57 per cent of total cost and cost C accounted for 90.91 per cent of total cost.

4.5 Farm Profitability of Aloe Vera Growers

Farm profitability is a crucial aspect of any agricultural venture, and Aloe Vera cultivation is no exception. Aloe Vera, with its numerous medicinal, cosmetic, and nutritional benefits, has gained widespread popularity and has become a lucrative crop for farmers around the world. Understanding the factors that contribute to the profitability of Aloe Vera cultivation is essential for farmers and investors seeking to maximize their returns in this sector. Aloe Vera's market demand is a critical driver of its profitability. The increasing consumer awareness and demand for natural and herbal products have created a favourable market for Aloe Vera-based products [5-8]. This demand encompasses sectors such as pharmaceuticals, cosmetics, health supplements, and food and beverages. Understanding the market dynamics and identifying potential market channels and product diversification opportunities are crucial for maximizing farm profitability [9,10]. Medium farmers had the maximum gross returns per hectare (250000) followed by semi medium (242500), small (240000) and marginal (235000) respectively. The input output ratio was highest for the medium farmers (2.75) and the lowest for the small farmers (2.39). The maximum yield per hectare was noticed to be highest for medium farmers and lowest for small farmers among all the different farm size groups. Gross and net returns per hectare were noticed to be increased with the increase in the farm size [11-13].

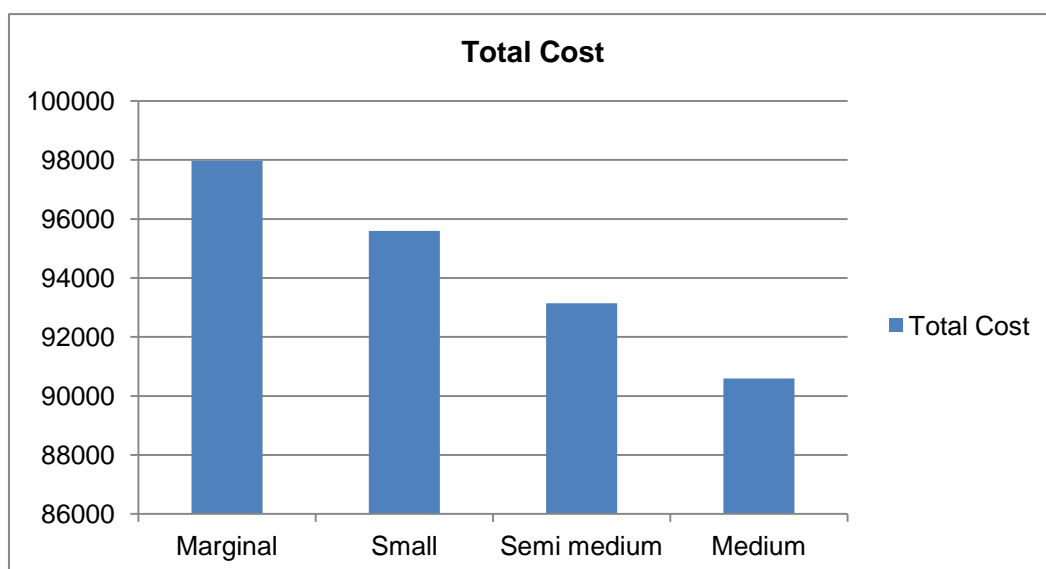


Fig. 1. Total cost of cultivation per hectare

Table 5. Cost, returns and profitability of aloe vera growers

Sl. No.	Particulars	Rs/ha			
		Marginal	Small	Semi medium	Medium
1	Yield in one year (in kg)	47000	48000	48500	50000
2	Gross Returns (in rupee)	235000	240000	242500	250000
3	Total cost of cultivation (in rupee)	97975	95691	92775	90610
4	Net returns (in rupee)	136988	144689	149483	158592
5	Cost A (in rupee)	62975	61085	58649	56881
6	Cost B (in rupee)	84368	82672	80461	78873
7	Cost C (in rupee)	89068	86992	84341	82373
8	Family labour income (in rupee)	150632	157328	162039	171127
9	Farm business income (in rupee)	172025	178915	183851	193119
10	Output/input ratio	2.39	2.50	2.61	2.75

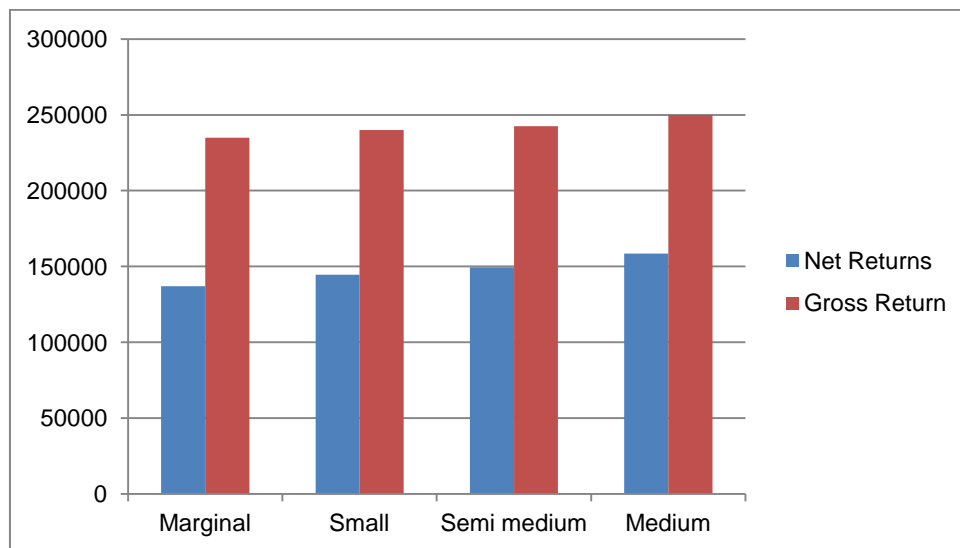


Fig. 2. Net and gross return of different size farm

5. CONCLUSION

The cost and return analysis, along with the assessment of farm profitability, provide valuable insights into the financial aspects of Aloe Vera cultivation. By evaluating the costs incurred at each stage of cultivation it was noticed that marginal farmers had the highest cost of cultivation per hectare (97975) followed by small (95596), semi medium (93147) and medium farmers had the lowest (90596). The cost analysis identifies key components such as land, infrastructure, baby plants, labour, inputs, water, equipment, utilities, and marketing. Understanding these costs helps farmers allocate resources efficiently, plan budgets, and assess the financial feasibility of Aloe Vera cultivation. Furthermore, assessing farm profitability provides a comprehensive understanding of the financial performance of Aloe Vera cultivation. Metrics such as gross

returns, net income, output input ratio offer insights into the profitability and efficiency of the venture. Input output ratio was 2.39, 2.50, 2.61 and 2.75 for marginal, small, semi medium and medium farmers respectively. In conclusion, the cost and return analysis, along with the assessment of farm profitability, are essential tools for farmers, investors, and policymakers involved in Aloe Vera cultivation.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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